THE CORNELL ENGINEER

COLLEGE OF ENGINEERING · CORNELL UNIVERSITY

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Contents

Cover: Sibley Dome in the Winter

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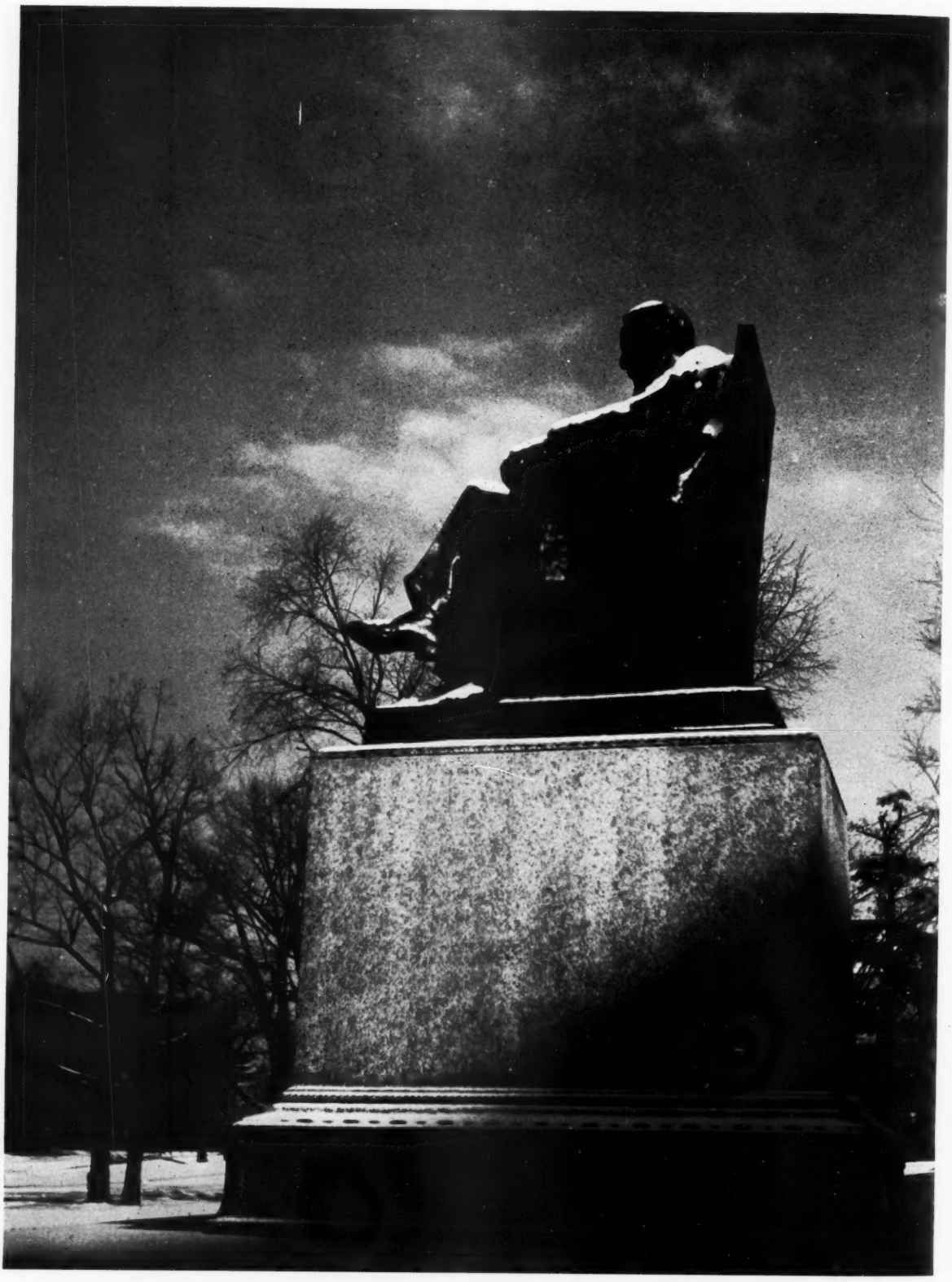


Winter Visits Andrew D. White

Editor's Column . . . . . *R. C. Ross '41*

No student could possibly step into a responsible position on this magazine and conduct its affairs without first receiving two or three years training and experience. The training in the past has been but the informal training that the succession of editors have been able to acquire and pass on. As the quality of the magazine will testify, this training has been enough to produce a fairly presentable magazine. Nevertheless, we on the staff of "The Engineer" are the first to admit our imperfection and the room for improvement. Since we can not look for further improvement within ourselves, we must seek it from elsewhere.

From the point of view of the faculty, they have been giving credit for a course for which the only tangible justification is the magazine. For these reasons the faculty has designated a course in engineering journalism to be given to the staff members of THE CORNELL ENGINEER beginning the first of next term. The course will be divided into an editorial and a business section and will include writing of technical articles, proof reading, copy reading, make up, accounting, advertising, and other related subjects. The editorial side will be in the capable hands of Raymond Howes, assistant to the dean of the College of Engineering and the business side will be under the direction of Assistant Professor R. Y. Thatcher of the School of Civil Engineering. Although the final plans have not been completed, it is contemplated that the course will be informal in nature.

The effect of such a course may not be noticed at first but ultimately will be seen in a finer, better magazine. Not only will the student receive much valuable training and experience along a line in which so many engineers need training and in which so few engineers receive training, but it will give the faculty a basis on which to award credit for the work on "The Engineer". We feel that a chance to compete for positions on the staff of "The Engineer" affords a wonderful opportunity and wish to call your attention to the notice on the college news page concerning the competition opening next term.

The cover of this issue is a familiar scene to the engineering students. It shows the campus under a record snowfall with Sibley Dome in the background. Also apparent to you are the new colors being used for the first time on the cover.

Next month we will hear from Dr. A. S. Adams, assistant to the Dean, who will give to our readers the details on the new University Extension School in Buffalo of which he is the director. Professor Emeritus Ries is writing the first of a series of articles by several faculty members on subjects pertaining to the foundry, his particular article dealing with foundry sands. At the same time we will introduce to our readers Assistant Professor G. R. McCaulley another newcomer on the faculty, Paul Simmonds C.E., Travers Nelson M.E., and Sam Brown E.E., all seniors of distinction. Be with us for the February Issue.

After Graduation . . . ? ? ?

An Expert Analyzes the Job Market for the June Graduate

HERBERT H. WILLIAMS, C.E. '25

Director, Cornell University Placement Bureau

A SENIOR'S job problems are different this year from what they have been in the past. Jobs will be plentiful, giving opportunity for more careful selection. The draft will require a year's military service and in many cases both the senior and the employer will be in doubt as to just when this service will be required. Some discussion of these questions and a description of the placement service available to seniors is appropriate now, when each man is thinking seriously of his future plans.

Perhaps the most immediate problem related to employment for a member of this year's class is that having to do with his military service. When will it come? How will it affect his chances of getting a job and of holding it thereafter? Seniors fall into one of three groups in relation to the draft. The first group includes all those who have been taking advanced military training and will receive reserve officers' commissions. The second group takes in all others who registered last October 15, 1940. And the third group is composed of those who have not yet registered because they were under twenty-one on the registration date. The problem of each group is different.

At the time this article is written there is no information available as to the Army's plans for calling reserve officers to active duty. We know that many of them will be called to assist in the training of draftees, and that all are subject to call at any time under certain conditions. Employers also know this and present indications are that a reserve officer is not considered a good prospect for a job. There is too much chance that he will be called for service soon after his employment has started. Probably most members of the senior class who are reserve officers will have an opportunity to volunteer for a year's service soon after graduation. If there is no indication during the spring as to the order in which reserve officers will be called, it will undoubtedly be best to volunteer and to seek a permanent job after the year is over, unless an employer can be found who will hire him under the circumstances. The University's placement services will be described further on, but it should be said here that men who will not be available for work for a year or more will find the University willing and able to assist them in their job search when they are ready for a job. It is quite probable that some plan of selecting reserve officers for active duty will be announced before June. Possibly each man will know, as do the draftees, just what their order of call will be. If this is the case their problem becomes similar to that of those with draft numbers.

Mr. Williams graduated from Cornell in 1925 and commenced his business career with the Port of New York Authority in the capacity of a rodman with the construction division. This interstate commission is responsible for the construction of the Goethals, Bayonne, George Washington and other bridges. During the building of the Bayonne Bridge Mr. Williams served as one of the Assistant Resident Engineers. He remained with this commission until 1934 when the University Placement Bureau was opened. He has served as the Director of this Bureau since that time.

About one hundred and forty-five engineering seniors are registered for the draft, only forty-two being under twenty-one on October 15, 1940. Each of these men has been given a number indicating the order in which he will be called in his own district. It is, therefore, possible for each man to learn from his local board about when he will have to report for duty. These boards are required to furnish a certain quota of men at stated intervals. Men are called by their order numbers and as an indeterminate number in each district are eliminated either for physical shortcomings or deferment of service, high order numbers will be reached in some districts before others. Employers will be interested in these "order numbers" and it will be a factor in selecting seniors for employment. One who will be drafted within a few months cannot be as acceptable as one who can stay long enough to get through the initial training period and into productive work. Some companies are in a position to select men with a view to their future usefulness and to such concerns the draft will have less importance. Others will employ men to fill immediate jobs rather than for training. These will watch the order numbers closely and will probably find it necessary to pass by those whose service will commence soon.

The senior who was too young to be registered for the draft, or one with a high order number, is the best bet for an employer, other qualifications being equal. All men in this category should make every effort to secure jobs to their liking. There will certainly be ample time for these men to prove their worth to an employer and perhaps to get a step or so up the ladder before Army duty calls a pause. There will, of course, be another registration day when those who have become twenty-one since October 15, 1940 will register. No one knows when this will be, nor how the next group will be drafted thereafter.

Whatever the draft status or availability of a senior for employment in June, he should seize every opportunity to investigate

The larger the draft registration . . .

jobs along the lines of his interest and to meet the company recruiters who visit the campus. Never again will he have such an opportunity to talk with representative employers and learn of their organizations.

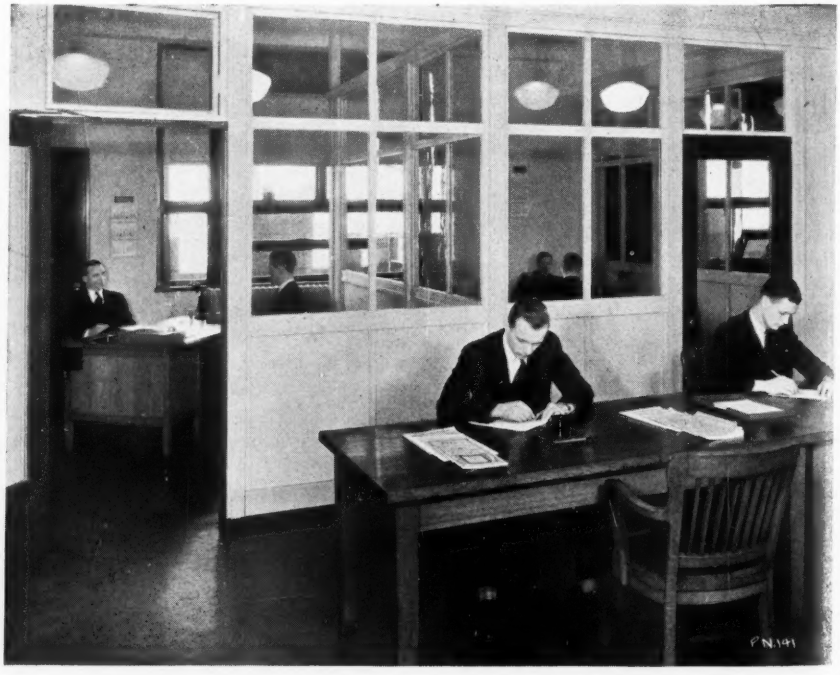
We have a new classification in industry this year, and it will probably be with us for some time. It is the "defense industry". In its broader sense a defense industry is any industry which supplies, or could supply, materials or equipment necessary for our land, air, and sea forces. In its narrower sense it becomes any company within a given industry which receives an order for material or equipment as a result of our defense program. In an industry such as aircraft, most of the output will be a result of defense orders, while in another, for example textiles, a relatively small proportion of the output will represent such orders. Jobs will naturally be more plentiful in companies working at capacity or undergoing expansion. Wherever there is much work there is much opportunity— opportunity to progress rapidly to successively better jobs, and to gain a variety of experience. Some of the companies which will visit the campus will have this character. Others will have no close connection with the defense program but will profit from it because of the increased purchasing power which it generates. As this is being written newspapers are predicting the greatest volume of Christmas sales in many years.

When jobs are easy to get, and they will be this year for those who are not to be immediately absorbed into military service, it becomes possible to exercise some choice as to kind of work, and as to type, size and location of company. Engineering seniors have learned this fall in their Non-Resident Lecture Series many of the factors to consider in making a wise choice. They have learned something of the kinds of work engineers do, of the necessity for choosing one's work carefully, and of the technique in interviewing employers and applying for jobs both in person and by mail.

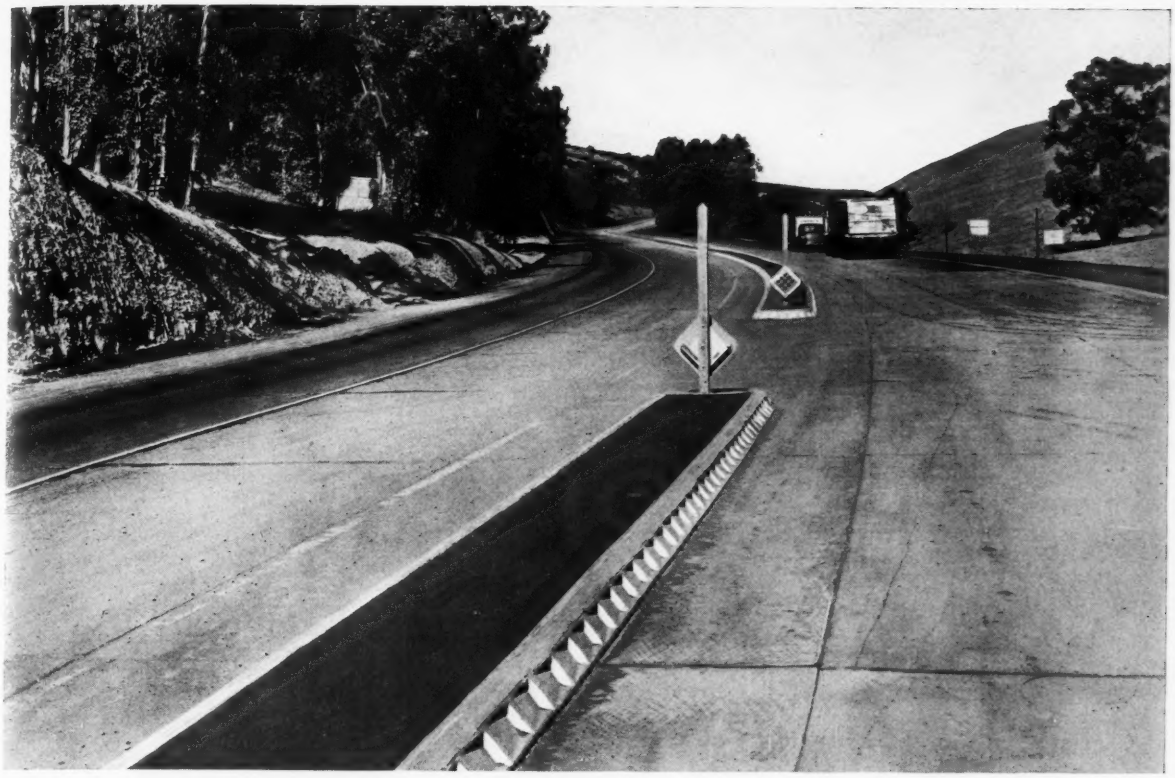
The time is at hand when this information should be applied. Recruiting has already begun. In January, February and March it will be very active, then to continue on at a slower pace through the rest of the term and summer. The Engineering College has developed excellent facilities to assist the senior in selecting and getting his job. Professor Rhodes in Chemical Engineering, Professor Perry in Civil Engineering, Professor Chamberlain in Electrical Engineering, and Professor Moynihan in Mechanical serve as personnel advisers to their respective schools, working closely with both students and employers. Their work is centralized through the Personnel Office in Sibley Dome, which is under the immediate supervision of Professor Moynihan, with Miss Elizabeth Page as secretary. Every senior should know and use that office. There most of the engineering companies do their interviewing, in private rooms provided for the purpose. And there all records and information covering companies and seniors are available for the asking.

One word of caution in connection with campus recruiting may be advisable. Not all the good companies visit the University and many excellent opportunities exist with those which are unable to send representatives here. Some do not have formal recruiting programs. Others are located some distance from Ithaca and do their recruiting in institutions more easily accessible. The Personnel Office will have correspondence from such companies describing positions open to seniors and inviting correspondence from those

(*Continued on page* 22)



. . . the greater the opportunity for employment.



Curbing of center dividing strip has recessed panels painted to reflect light at night as an added safety design, in San Diego County.

Roads: California Style

W. F. FAUSTMAN, C.E. '07
Assistant Engineer

How a state with the second largest motor vehicle registration builds good highways on a limited budget

California now shares with New York State the top position for number of motor vehicles registered. However, Californians are taxed much less per vehicle, ranking 45th among the various states in average motor and gas receipts per motor vehicle in 1937; California collected $28.42 per vehicle, as compared to $44.82 in New York State.

The total amount budgeted for the current biennium is $85,376,000, of which about 59% is for construction of highways and bridges, and 24% for general and specific maintenance work, the balance being for right of way cost, preliminary and construction engineering, equipment, administration, etc.

In general, we have three main topographical highway conditions —valley, foothill, and mountain— requiring consideration in design and construction. Our standards call for 22-foot width for two-lane roads, and 23 feet for each section of a four-lane divided pavement. Five and 6% grades are used for valley roads, while on foothills and mountain roads the maximum may reach 7% or 8%. Curvature may run from 500′ minimum on valley roads, to 200′ on other roads. Higher traffic demands lower grades and flatter curves, with greater width for safety and speed of the modern vehicle.

Safety

While due regard has long been had for safe and sane highway design, it was not until early in 1938 that formal safety action was taken in California by the establishment of a Department of Traffic Safety, as a part of the Division of Highways. One of our district engineers, experienced in all phases of engineering work, was appointed safety engineer, and the department now includes several assistant engineers at Sacramento, and safety engineers in each of the eleven district offices,

Tractors equipped with big rubber-tired wheels and weighted with bags of cement rolling soil-cement base construction, in Siskiyou County

who supervise traffic counts, check on the cause and possible prevention of highway accidents, and cooperate with all other branches of highway work in order to lessen as much as possible all traffic accidents. Patrolmen work under supervision of the Motor Vehicle Department, but cooperate with all highway agencies.

Design Policies

Present highway design policies require intensive investigation, during the planning stage, of subsurface conditions which might affect the stability of the roadway. From $100 to $1,000 per mile may be expended for such work, which includes soil borings and other exploratory work by the district materials engineers. By this means, the frequency of major slides, slipouts, and settlements, with interruptions to traffic, has been greatly lessened. These studies of foundation conditions often result in changed design of surfacing, and intermediate types may be used in place of former high type pavements. In other cases, surface thickness may be lessened due to better foundation.

Bases

Base courses generally consist of crusher run gravel or quarried rock, spread about 6″ thick in the form of slurry base, mixed in a pugmill with water. However, on several recent projects, soils have first been stabilized with mixtures of Portland cement or asphaltic oil.

Cement stabilization formerly consisted of preparing properly selected soils, harrowing, discing, and adding about one part cement to ten parts of soil, shaping, rolling, and curing with water for seven days.

Better results have been obtained by mixing the soil with 5% to 8% of cement in a pugmill at a central plant, giving a more uniform product than can be secured by the road-mix method. The mixture is hauled and spread over subgrade, rolled with pneumatic type or sheepsfoot rollers, and cured for 7 days with a seal of 1/10-1/6 gallon per square yard of cut-back asphaltic oil. A recent 6″x24′ base cost $2.40 per ton, or $9,500 per mile.

Another project had an emulsified asphalt stabilized base, using about 3-1/2% emulsified asphalt, 12% water, and imported material, mixed and rolled as above described. This type cost about $2.50 per ton, or $7,000 per mile, for a 6″x40′ section.

Bituminous Treated Surfaces

Both plant-mix and road-mix oiled surfaces have become very popular, and many miles of our California mountain and foothill highways carry traffic which is amply handled by these intermediate types of surfaces.

Our Materials and Research Laboratory, in conjunction with the Construction Department, has developed methods for determining the amount of liquid asphalt required for any given aggregate. This method consists essentially of coating the aggregate with an oil solvent and then removing the excess in a centrifuge. Since the procedure is adaptable to field practice, it aids materially in the proper control of road-mix surfaces, and removes much of the uncertainty in this type of construction.

Travelling machines are being used extensively in road-mix construction, and are giving good results. However, the so-called plant-mix type of oiled surface, wherein the aggregate and liquid asphalt are carefully mixed in a pugmill at a central mixing plant, gives more accurate control of operations, and very excellent results. By way of comparison, the mileages shown on the chart on the next page have been built during the past several years.

Asphalt Concrete Pavements

It has been found during recent years that asphaltic cements with higher penetration have given much improved results in asphalt concrete pavements. The three permissible penetration ranges

are: 71-85, 86-100, and 101-120, the grade used to fit particular conditions.

Mixture gradings have been raised to permit the use of coarser sands and less filler dust, thus giving a mixture that is easier to manipulate and less critical to fluctuations in asphalt content. Automatic scales are used on nearly all proportioning plants.

Spreading and finishing machines have been greatly improved, several California makes being superior in many ways. Three-axle rollers have reduced the amount of compaction equipment on large jobs, and also result in greater surface smoothness, with less effort and uncertainty than former methods.

A seal coat of 1/10 gallon per square yard of emulsified asphalt, is now being used, without the condition of the former screenings. This treatment prevents raveling even in cold weather construction, and seals the surfaces against water infiltration. Traffic is permitted on the pavement soon after sealing, and surfaces remain tight for several years.

Year	Concrete Pavt.	Asphalt Pavt.	Plant-Mix Surface	Road-Mix Surface
1936	60.1	34.6	82.1	114.9
1937	92.3	89.5	119.9	109.2
1938	65.5	77.0	122.0	92.0
1939	12.1	12.4	117.8	140.9
1940	40±	55±	182.0	64.0

Portland Cement Concrete Pavements

In general, portland cement concrete pavements are not reinforced, as is often done in the East, because of the more equable climatic conditions in California. Even the former practice of using ½″ marginal steel bars, in 10′ x 20′ panels, is no longer used. The standard cross-section is generally 11′x.55′—.75′, with 2, 3 or 4 lanes of pavement, depending on the traffic. Expansion joints are generally 60′—120′ on centers, with weakened plane joints 20′ or 30′ apart, all with ¾″ x 14″ steel dowels 15′ apart, painted and greased, with one end in a 3″ metal expansion sleeve. Both 5- and 6-sack cement mixes are now being used, the average 28-day compressive strength during 1939 being 3740 pounds per square inch for the Class B, or 5-sack concrete, and 5150 pounds for the Class A, or 6-sack concrete. An experimental 4-sack pavement had an average strength of 3080 pounds per square inch.

Cement is generally furnished in sacks, and automatic scales are used to proportion the aggregates. A mechanical drag finisher has been developed for surface finishing which gives excellent results when used in connection with the regular mechanical tamper and finisher, and a steel cut float is used for final finishing. Water curing with burlap is still the most satisfactory method of curing concrete pavement, although colorless bituminous membrane has also been used. Some experimental curing with cotton mats, furnished by the U. S. Government, has also been tried with good results, but the cost of the mats makes this method of curing somewhat expensive.

Six-lane free-way with 11-foot asphalt concrete, portland cement concrete, and plant-mix pavement strips on Arroyo Seco Parkway between Los Angeles and Pasadena

State Route **45** *through Altamont Pass in Alameda County has two* **22**-*foot road-mix surface lanes with* **4**-*foot dividing strip.*

Test Track

Under supervision of the Materials and Research Department, a test track, 15′ wide by 600′ long, was recently built at Sacramento, in order to develop exact data for better design of low-cost roads. Eight sections, 7.5′x100′, were constructed by excavating, backfilling with 6″ of sand and screenings, and placing a 12″ layer of compacted soil. On this base, 8 different types of treatment were placed: (1) untreated crusher-run base; (2) cemented gravel mixture, untreated, and stabilized with cement and with emulsified asphalt; (3) sand clay mixture, untreated, and stabilized with cement, emulsified asphalt and cutback asphalt. These materials were placed in thicknesses varying from 3″ to 18″, and covered with a 2″ layer of plant-mixed oil surfacing. Loaded trucks were then run over these tracks, and studies made of the behavior of the various sections under dry and saturated base conditions.

This trick was also used to conduct a number of other tests not connected with foundation treatment. The Traffic Safety Department secured data on various types of automatic traffic recorders; also load carrying capacity and abrasion resistance of low-cost bituminous surface mixtures were tested, and several kinds of traffic lacquers were tried out. Roughness measurements were made with a specially-designed portable roughometer.

Prison Road Camps

Convict labor has been employed on certain roads in the mountainous or foothill regions of California since 1915, when the first convict labor law was enacted. Since that time, a total of 525 miles have been completed by convict labor at a cost of about $25,000,000, an average of $47,700 per mile.

At present, there are but four camps in operation, averaging about 100 men per camp, located in Trinity, Kern, San Diego, and Los Angeles Counties. The men are under the supervision of a sergeant and three or four guards (together with a superintendent) detailed for duty by the wardens of San Quentin and Folsom Prisons. The cost of road construction by this method is about equal to the cost by contract methods, but the State gains by the reduction of cost at the State Prisons, and by the rehabilitation value to the convicts themselves of healthy work out in the open. Under the law, the men are credited with one-half day off their prison sentences for each day worked, and $2.10 per day convict wage, from which is deducted the cost of guarding, meals, transportation, and other costs incidental to camp operation. A superintendent, foremen, and other skilled labor operate all equipment, and necessary engineering and clerical help is also provided.

San Francisco-Oakland Bay Bridge

Although California, with its excellent highway system, has constructed many notable examples of road and bridge design, the outstanding project has, of course, been the San Francisco-Oakland Bay Bridge, opened November 12, 1936, and completed in 1937, at a cost of $77,000,000. The bridge was financed by RFC loan, which was later replaced by 4% toll bridge revenue bonds. The opening toll rate was 65c per automobile, and this has been reduced several times until, at the present time, the toll is but 25c per car. The lower bond interest, together

(*Continued on page* 24)

Mass Housing

Engineers face a multitude of problems for the sake of low-cost housing

CLYDE H. LOUGHRIDGE, M.E. '43

WATCHING a housing project grow from blueprints to a community is a fascinating sight. It has been my privilege to follow the progress on Cleveland's recently completed Valley View Homes which have brought new high standards of living to twenty-three hundred people of the city's most densely populated and crime-infested area. On the thirty-three acres overlooking the Cuyahoga River Valley now stand seventy row-houses comprising a total of 582 dwelling units. Monthly rents range from $19.20 to $22.25 and include electrical refrigeration, steam heat, hot and cold water, light, and gas. The four acres of private yards and gardens provide a safe place for children to play.

Rising from the slums of nearly all our larger cities, hundreds of government housing projects like this one have attracted the efforts and interests of many of the country's foremost architects and engineers. For any given project the architects first set the size of the rooms and number of them per dwelling unit, after which plans are sent to the structural, mechanical, and electrical engineers.

The structural engineer is faced first with the problem of the type of foundation. To determine this accurately he must know exactly what kind of soil is to be found at every spot on the project. Particularly important are the elevations at which the soil strata change. Borings are taken ten to fifty feet deep at various intervals, the samples at different levels being sealed in jars. The soil in the jars is then analyzed and tested for water content. Samples are sometimes subjected to a pressure exceeding that of the prospective building by a factor of three. It is thus possible to construct the foundations so that the building will not settle.

In good soil the foundation may consist of a concrete wall built on a wider footing sunk several feet below grade. As soil conditions become worse, this wall is made deeper and deeper until a depth of ten feet is reached. It is not economical to carry concrete footings farther than this depth. In very poor soil the engineer resorts to piles for support.

At the Valley View Homes a railroad was built on the project for unloading coal at the boiler room. The boiler room is located in the Cuyahoga River valley where the soil is soft clay. Because of the tremendous weight of the boiler room and the stored coal, a retaining wall and large spread foundations were necessary. To support the railroad, piles were driven and I-beams laid across them.

On the site where the new Norton Homes in Barberton, Ohio, is to be built, there is water within two feet of the surface. Because it would be too expensive to seal the crawl spaces (spaces between ground and first floor slabs when there is no basement) the buildings of this project will be without them. As piles are also comparatively expensive, the foundations will probably consist of eight- to twelve-inch thick concrete slabs. This would distribute the weight better and reduce the pressure on the soil. When used to support buildings, piles are driven at certain intervals along the perimeter of the building. Concrete footings are then poured on top of the piles.

Foundation walls of concrete, cinder block, brick, or concrete block are carried up to grade. From this point finished walls are constructed. Walls of four-inch brick facing, with two by four-inch studding on the inside, finished with lath and plaster, have become almost standard for low cost housing. Insulating the walls against heat transmission has been proved to pay for itself. The most recent improvement in housing construction, however, is the use of cavity walls instead of this conventional wall. Low cost and reduced permeability to rain and moisture are the features of this type of wall. It is constructed in two sections separated by a continuous air space. The outer masonry section is connected to the inner one by metal ties. Any water that gets through the first section will run down its inside face, never reaching the inner section. To make this type of wall construction as strong as the conventional eight-inch wall, a high-strength mortar must be used.

**Masonry mortar, prepared in a small drum mixer at a central plant on site, was hauled to the masons' line by a two-wheeled tractor trailer. (*Valley View Homes, Cleveland, Ohio.*
—Courtesy U. S. Housing Authority

A small trench machine was used for shallow trench digging. Deep trenches were dug and back-filled with crawler crane and bucket. Project was equipped with 15 tractors and 15 trailers, which were put to various uses.

The first floor is almost invariably ¾ inch oak flooring laid on a thick concrete slab. This protects the residents against vermin, keeps out moisture, and insures a solid foundation for partitions. Down the center of the building, and built right in with the floor slab, is a concrete beam with steel reinforcing rods laid lengthwise several inches apart. The floor itself is reinforced by pouring the concrete over suspended steel mesh. When there are only two floors to a building, the second floor is made of cross-bridged wood joist on sixteen-inch centers with ¾ inch floor boards, a sheet of paper to seal it from dust, and finally a ¾ inch finished oak flooring. Roofs are either flat or pitched, both often being used on the same job to vary the appearance of the buildings.

The structural engineer must figure all beams and joists, and, in short, check everything that affects the stability of the building. Every place the span length changes the beams must be refigured to insure safety of construction. In some private jobs beams are of sufficient strength until, during construction, the steam fitter or plumber comes along and saws out a four or five inch hole to admit a large pipe. If done in certain places, this may weaken the joist to a point where it is practically useless. This state of affairs does not occur in housing jobs. The structural engineer designs the beams with the holes already in them and then makes allowance for the weakness by extra reinforcing. The stair wells, trap doors to crawl spaces, and any other places where large sections are removed from the floor, are all framed out. Continuity of framing is maintained by placing incinerators and plumbing slots out of the line of interior beams. Double joists are installed in the floor under partitions.

Every precaution must be taken by the structural engineer to insure safety from fire in the finished building. He must choose fire-resistant materials, and allow proper clearances between chimneys and wood construction. Spread of fire is prevented by enclosure of stair wells and shafts with fire-proof materials, and by dividing large buildings with fire walls at safe intervals.

Heating and plumbing are the job of the mechanical engineer. Before considering the method of heating to be used, a careful estimate of the heat loss of each building must be made. To do this the areas and thicknesses of the different materials in each room are obtained from the architects' preliminary drawings. Then the heat loss is calculated by the use of tables. Knowing the heat required for each building, the engineer can easily determine the amount of steam or gas necessary for the project. To decide what type of heating will be most economical a government chart called an Economic Heating Analysis is filled out by the mechanical engineer. On this chart the costs of several possible systems such as gas, coal, steam, or hot water, are broken down and analyzed as follows:

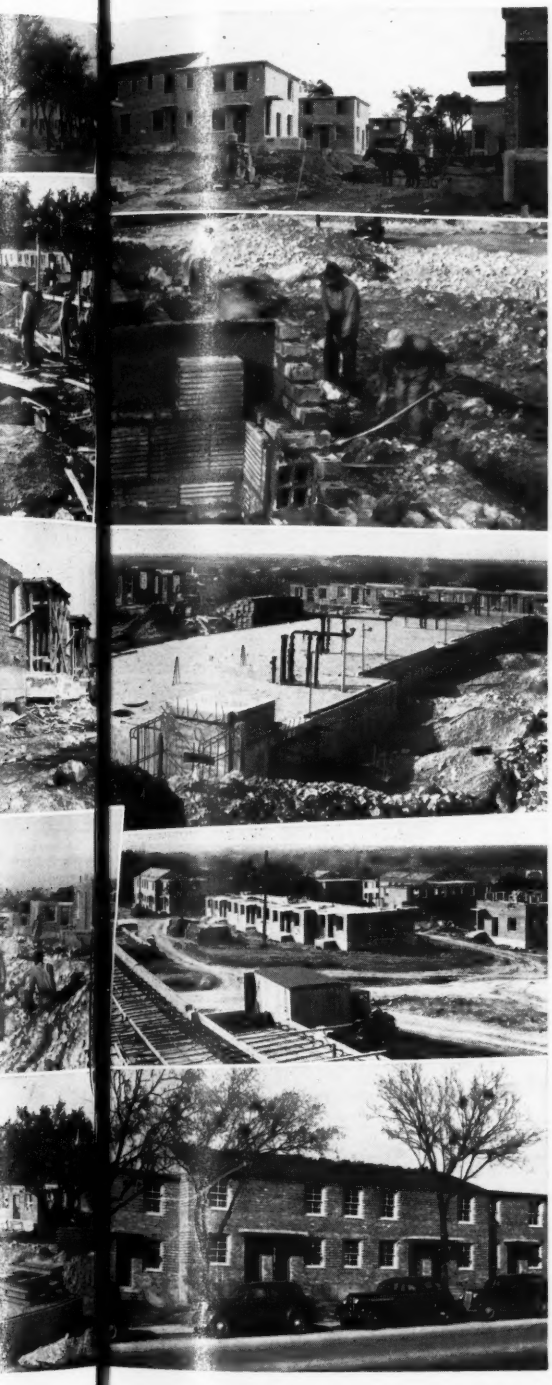
1. Initial cost.
2. Annual cost of capital, operation, maintenance, repairs, and replacements.
3. Space requirements.
4. Effect of fuel and plant selected on building and site plans.
5. Continued availability of fuel and probable trend of its price.
6. Noise and dirt.
7. Obsolescence and ability to change or modernize.

The type for which the cost per room is lowest is the one that will be installed. All these data and figures are checked by the United States Housing Authority in Washington.

Most large housing projects in the North are heated by steam or hot water. The bigger the boiler plant, the more efficient it is, so that steam is cheaper than hot water for large projects. Hot air is used less, because basements are necessary, and hot-air furnace maintenance is high. Very large projects—over three hundred dwelling units—usually use high pressure steam; whereas, those of medium size use low pressure steam. Small projects often use individual hot water heaters. This saves on operating costs, because

Stages of constru of new

each tenant fires his own heater. For units on the same level, such as flats, a gravity hot water system may be used. Life of a hot water system is longer than that of a steam system, because steam corrodes the pipes sooner.



—Courtesy Fort Worth Housing Authority

...s of construction of new dwellings

By the time this preliminary work is completed, the mechanical engineer has received finished plans from the architects. Considering that a steam or hot water system is to be used, all the radiators are spotted in the rooms of each type building. This work must be done carefully, so that the livability will not be hampered by poor location of pipes and radiators. Piping between the radiators is then laid out. On long runs, expansion joints must be provided. Next, the pipes are sized. Division of the project into groups is made for more efficient control. The steam for each group is regulated by a thermostatically controlled valve, which has an electrical connection to an outside thermometer. This type of control prevents overheating and thus saves unnecessary expense.

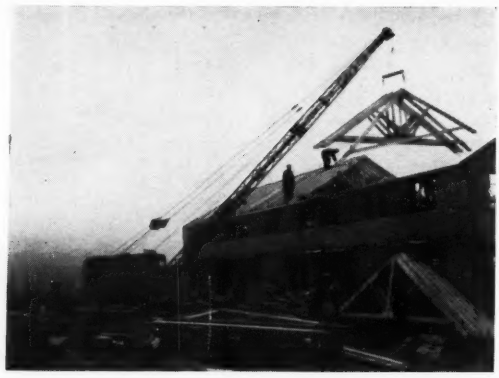
On projects which buy their steam from a local company, economizers are used to derive more heat from the steam before it is turned into the sewer. The used steam is sent through copper coils in a hot water tank and then exhausted. As the plumbing code in some cities requires that no steam be put into the sewers unless cooled to 180 degrees, the economizers serve both to cool the steam and to heat water for the tenants' use. However, economizers are unnecessary if the project has its own boiler plant, because the used steam goes right back to the boiler. Of course summer comfort is an important consideration. To provide proper air movement in hot weather, windows and buildings are placed with regard to prevailing winds.

Plumbing is the next consideration for the mechanical engineer. All the bathroom and kitchen fixtures are spotted on the plans by the architects to suit their design. These fixtures must be connected to drains and hot- and cold-water lines. The landscape architect furnishes the mechanical engineer with a plan showing contours of the grounds and elevations of all buildings. With this plan and a map from the city showing locations and elevations of all sanitary and storm sewers in and around the project grounds, the engineer is prepared to lay out the utility lines. He does this by making a profile drawing of pairs of buildings which are connected with pipe lines. From this drawing, on which the building elevations are shown graphically, slopes of connecting pipes are determined. Should a building be too low to drain to the nearest sewer, the whole building may be raised. This is usually cheaper than maintaining a sump pump to force the water up into the sewer. A thorough investigation of existing sewers is required to make sure that they, plus the proposed new ones, will have enough capacity to carry away sanitary sewage and storm water at all times without back-flooding.

The yard drains, which take the run-off from rains, are also laid out with the utility lines. All plumbing pipes are finally sized on the basis of maximum momentary demand.

If the electrical service is distributed underground, there may be conflicts between wire conduits and the numerous plumbing and heating pipes. The utility lines must also be coordinated with the landscaping. Because of these factors, it might be well to mention the necessity of close cooperation among the engineers and coordination of the contractors' work.

The electrical engineer is first concerned with the service for lighting and power. Lighting is always single-phase 115 volts. Power service depends on requirements of the project, but is usually single- or three-phase. To determine the amount of power necessary, the engineer is usually required to think through a whole day's living in the building in question, noting the maximum load for any fifteen- or thirty-minute period throughout the day. For instance, in an apartment suite from 8 to 8:15 in the evening several sixty- to one hundred-watt lamps, the refrigerator, radio,



Crawler cranes raised wooden trusses for hip roofs four at a time. Members were cut by electric power saws and templates and assembled on the ground. Carpenters at each end and at ridge line rapidly placed each truss in position. Crane followed with sheeting after trussing was completed. *Valley View Homes, Cleveland, Ohio.*

—Courtesy U. S. Housing Authority

two clocks, and an iron may all be going at the same time. Actually, however, tables made empirically from past experience in housing projects are furnished the housing engineer. It is then fairly simple to determine the kilowatt-hour consumption per month for the project.

Under usual circumstances, such as arranging service for a house or building, the electrical engineer needs only to call the local service company and tell them what service is required. Service is then brought into the building panel from the nearest pole. The housing project, however, presents new problems to the engineer, for the utility company brings the service only to the edge of the project. It is metered here on the high tension side and sold to the management at a wholesale rate.

There are two methods of distributing the service to the individual buildings, by overhead pole line or by underground construction. The pole line, although cheaper, is less desirable, for it is ugly, it interferes with landscaping, and requires more attention and repairs. The modern trend is to eliminate the pole line, and some cities, particularly in the East, have passed laws requiring the service company to put so many miles of pole line underground per year. In such cities it would be foolish to use a pole line for a government project. In bad slum areas, however, and for very low cost housing, pole line construction is being used.

The poles are situated so that they may be tapped off for buildings on each side. Poles are spaced about 125 feet apart or at some other distance that complies with local service company standards. As pole lines have to be guyed at each end, they must run straight. Light and power lines are installed on the poles with extra space reserved for telephone lines, which are put up by the telephone company. From pole number one, where the current is metered, high tension primaries on the top cross arm of each carry service to transformers throughout the project. The high tension line is often three-phase, in which case the engineer, in distributing high tension service to transformers, tries to load each phase equally. Each transformer, the size of which is kept to a minimum for mechanical reasons, is located in the middle of the area to be fed by its secondaries. Four hundred feet is the maximum distance that a secondary line may be run from transformer to buildings. Of course these lines are made as short as possible, both for economy of wire and for reduction of IR drop in the line.

Wires and equipment for the pole line are usually in accordance with the local service company's standards, for often it is they who will repair the line and make necessary replacements. The wires used are never smaller than number six, because the copper in lighter wire is not strong enough to stand the strain unless poles are placed nearer together.

For secondary lines from transformer to building, either the Edison, single-phase, 115-230 volt, three-wire distribution system, or three-phase, four-wire, grounded neutral is used. One improvement to be noted concerning secondary drops to buildings is the installation of single drop cables containing the three necessary wires cabled under a common braid. The appearance is thus improved by eliminating the two or three wires to each building, which usually develop different sags.

The other type of distribution system, underground, is much more expensive than the pole line, but in many cases appearance justifies the expense. The old tried and true method of underground installation is that of manholes connected by ducts set in concrete. Lead-covered or twenty-milligram, low - water - absorption cables are drawn through these ducts.

The newest type of underground cable is a ten-milligram cable which is so water-resistant that it can be buried directly in the ground without protection of ducts. The trench for the cable is lined with four inches of sand; the cable is then laid on this followed by another four inches of sand. Before the trench is filled with dirt, a two by ten creosoted plank is placed over the last layer of sand. If someone should happen to dig over one of these cables a number of years later, the plank would protect the cable and point out its location to the digger. For future cable replacement, fibre ducts are placed under all cement walls, extending one foot on each side.

The aim of either a underground or a pole-line distribution

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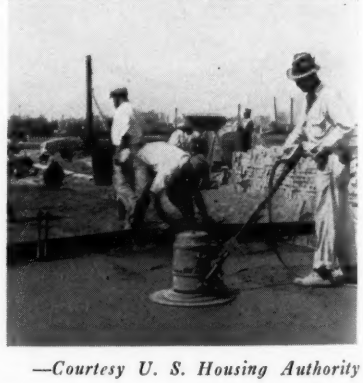


—Courtesy U. S. Housing Authority

Electrically-powered finishing machines were used for 433,000 sq. ft. of floor. Poles carried plug boxes for 110 and 220 volt equipment. *Valley View Homes, Cleveland, Ohio.*

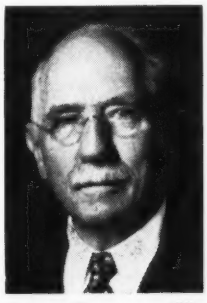
The Alumni . . .

ASME CONVENTION

A Robert H. Thurston Student Takes a Prize

"Albert Kingsbury — Engineer, inventor, manufacturer, and student of the methods of lubrication, who has spent a lifetime preventing waste and destruction from friction by supporting of huge masses of machinery on thin films of oil and has provided for hydraulic turbines and other weighty mechanisms the remarkable bearing known by his name."

So reads the citation conferred on Albert Kingsbury, a distinguished Cornell alumnus, on the occasion of his being awarded honorary membership in the American Society of Mechanical Engineers at the 61st Annual meeting of the society on December fourth. Singular as this honor is, it is not the first time Mr. Kingsbury's work has been publicy recognized. In 1923 he was awarded the Franklin Institute's Cresson Medal, and in 1931 he was recipient of the A.S.M.E. Medal for his research and development work in the field of lubrication and its application to the Kingsbury Pivoted Shoe Thrust Bearing which made possible large hydroelectric generating units and is used as the main propellor thrust block on virtually all modern large-sized American vessels. Many Cornell alumni, even though not having encountered lubrication problems in practice, are undoubtedly familiar with this bearing, since the study of it is included in machine design courses and a small model of it is one of the prize exhibits of the freshman engineering laboratory.



ALBERT KINGSBURY '89

Mr. Kingsbury, who is famed as an inventor, studied mechanical engineering at Ohio State and Cornell, graduating with the Cornell M. E. degree in 1889. Since then he has taken out over 70 United States patents in the field of mechanical engineering and lubrication.

While at Cornell as a student, Mr. Kingsbury had the extreme good fortune to work under Professor Robert H. Thurston on the latter's famous oil testing machine and proved by using excellently fitted bearing surfaces of his own manufacture that even kerosene can be made to produce perfect film lubrication under surprisingly heavy loads.

After graduation from Cornell he went to New Hampshire College to teach engineering subjects, becoming professor of mechanical engineering there. From 1899 to 1903 he was professor of applied mechanics at the Worcester Polytechnic Institute. While at New Hampshire College, Mr. Kingsbury published a report on air film lubrication and developed the theory of film lubrication. He continued his development work on thrust and journal bearings at Worcester Poly, and there constructed an important oil testing machine of his own design. This work led to the introduction, in 1910, of the Kingsbury Pivoted Shoe Thrust Bearing as applied to Westinghouse turbines.

Mr. Kingsbury joined the staff of the Westinghouse Electric and Manufacturing Company at East Pittsburgh in 1903. In 1910 he set up a private consultant engineering practice; and in 1912 completed the first large vertical thrust bearing for hydroelectric service, installing it in the Holtwood plant on the Susquehanna River near Lancaster, Pa. A ceremonial inspection made 25 years later (June 27, 1937) showed that the aggregate wear on this bearing was still too small to measure.

In 1919 Mr. Kingsbury set up the Kingsbury Machine Works at Philadelphia, and still continues active in its presidency. He has also been active, largely as chairman, on the ASME Special Research Committee on Lubrication. Numerous citations in standard British works attest his long-maintained position as a world authority on lubrication.

Mr. Kingsbury is also a Fellow in AAAS, life member of the American Institute of Electrical Engineers, and a member of Sigma Xi and the Society for the Promotion of Engineering Education.

"For Distinguished Work in Hydraulic Engineering. . ."

Among the other Cornell alumni honored at the convention was William B. Gregory, ME '94, for his outstanding contributions to permanent engineering literature. Mr. Gregory, who is now professor emeritus of experimental engineering and hydraulics at Tulane University, was awarded the 1940 Worcester Reed Warner Medal "for distinguished work in hydraulic engineering, which has been the basis of many engineering papers".

In 1894 Mr. Gregory joined the faculty of the newly organized college of engineering at Tulane University and continued there until his retirement in 1938, with the exception of a year of resident study at Cornell in 1908 when he was awarded the degree of Master of Mechanical Engineering.

He has served many organizations as a consultant. As a major

(*Continued on page* 24)

CORNELL SOCIETY of ENGINEERS

"The objects of this Society are to promote the welfare of the College of Engineering at Cornell University, its graduates and former students and to establish a closer relationship between the college and the alumni."

President's Message

Fellow Engineers:

It is with great pleasure that the officers of the Cornell Society of Engineers announce the organization of the New Jersey Regional Section. This marks another step in the expansion and effective decentralization of the Society's activities and brings to a total of five the number of active regional groups (Philadelphia, Pittsburgh, Syracuse, New York Metropolitan area, and New Jersey).

The officers of the New Jersey regional section are:

George N. Brown '08, Chairman

William H. Hill '22, Vice-Chairman

Robert D. Wilder '27, Secretary.

In accordance with the constitution of the Society, the chairman of the section automatically becomes a vice-president of the Society and a member of the Executive Committee. His fellow officers congratulate George Brown upon his organization work and greet him in his new position on the Executive Committee. Incidentally, he is already a member of the Executive Committee, since he has served for a number of years as Chairman of the Membership Committee and is now serving a two-year term as representative of the School of Electrical Engineering.

Credit goes in the organization of this new region to Professor John R. Bangs, our active and hard-working Chairman of the Regional Committee, and to Walker Cisler '22, member of the Committee on Alumni Representation, who has worked diligently for the benefit of the Society for many years.

It is my hope that by the time the next issue of THE CORNELL ENGINEER goes to press we shall be able to make at least one more announcement of this kind.

The New York Region held a successful dinner meeting on Thursday evening, December 5th, at the Cornell Club of New York. Since this was the week of the A.S.M.E. convention in New York, a number of out of town alumni and faculty were present. Following dinner, the members of the Society heard Dean Hollister describe the many defense activities in which the University is cooperating. He has been appointed by President Day as the liaison man between the University and the Government Defense Groups. J. Carlton Ward '14, President of the Fairchild Engine & Airplane Corporation, then gave us a vivid inside picture of what happened in France preceding her collapse. As a member of an American mission to study the French aviation industry, he was in an unusual position to observe conditions. Those who have read the account of his talks at Sibley, in the October issue of THE CORNELL ENGINEER, can gain some idea of the interest with which he held his listeners. The lesson for this country is tremendously important.

The Syracuse Region, under the direction of Vice-President Henry B. Brewster '98, writes that they are planning a meeting for the early part of the new year with Dean Hollister as guest of honor.

"Barney" Savage '25, chairman of the Meetings Committee, announces a dinner meeting of the New York Region for Friday evening, January 17th, at 6:30 o'clock, to coincide with the convention of the A.S.C.E. Those who plan to attend the A.S.C.E. meeting in New York should jot this date and address down and plan to attend. It will be held at the Cornell Club of New York, 107 East 48th Street.

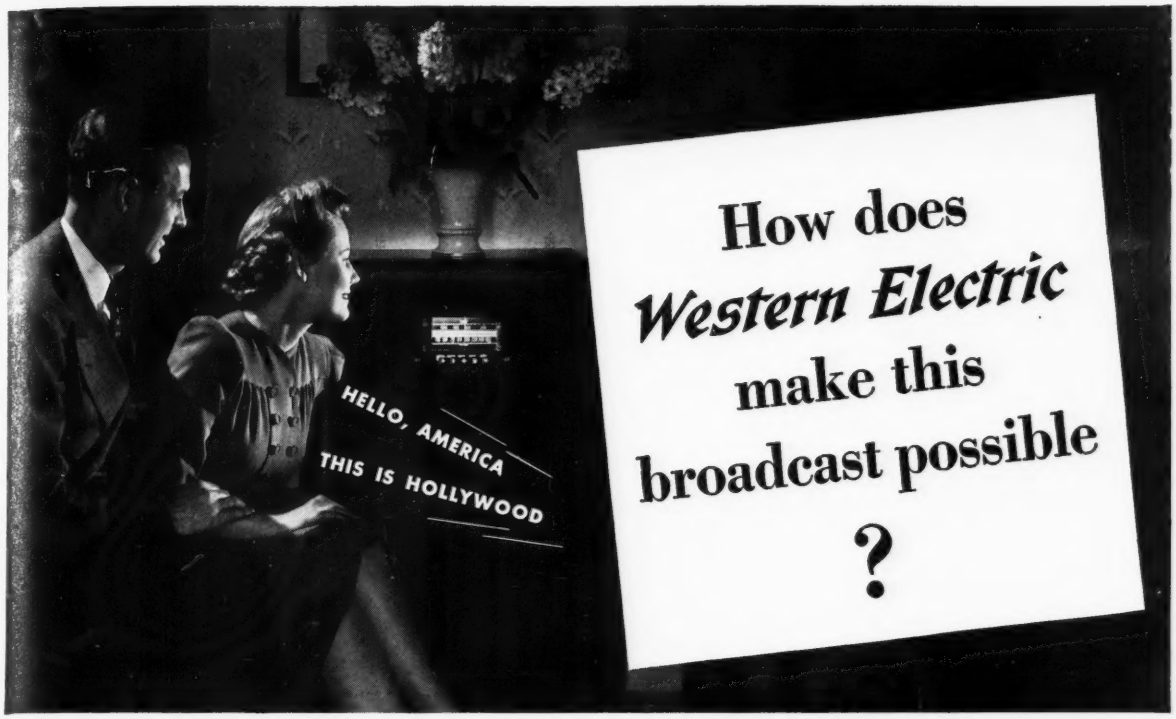
Furman South, Jr. '12, Vice-President of the Pittsburgh Region, writes that while there is no special news of the Cornell Society of Engineers now, they plan a special meeting late in the winter or early spring.

The Philadelphia Region also plans a meeting in January. Details will be announced later by Chairman Day.

Yours very truly

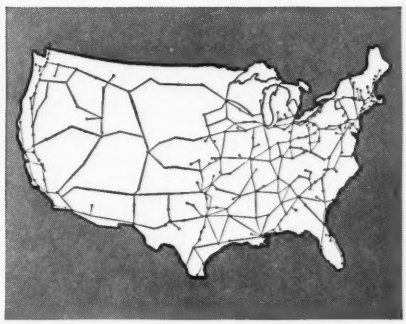
JOHN P, SYME '26

President



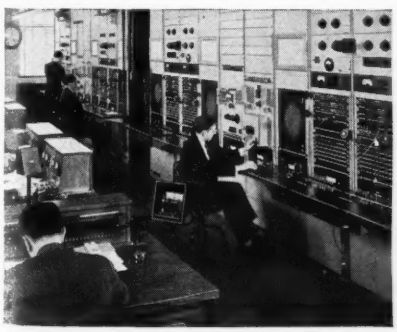
How does *Western Electric* make this broadcast possible ?

In the development of radio—that important influence in modern life—Western Electric equipment has played a big part.



Here are the main routes of the high quality Bell System lines employed in broadcasting service. The "network broadcast" travels over these wires.

The thousands of miles of wire and cable, the poles, the countless items of apparatus were supplied by Western Electric, manufacturer and purchaser for the Bell System.



Telephone company 'control offices' like this one, Western Electric equipped, are located at important cities. They switch the network program to selected broadcasting stations.

To keep the program at full brilliance, Western Electric vacuum tubes at "repeater stations" amplify the electrical impulses with complete fidelity.

So, out of the telephone art has come much of broadcasting's plant. This apparatus is made by Western Electric with the same skill as your Bell Telephone.

Western Electric *... is back of your Bell Telephone service*

Prominent Among

Air Conditioner

Prof. Mackey

It was on one of his frequent sailing jaunts—this time it happened to be at the north end of Cayuga Lake: Charles Osborn Mackey was sleeping in his boat when the station agent brought him the telegram which carried an offer to teach during his junior year in college. This was the beginning of Prof. Mackey's teaching career, a career which was to lead him to his present position of Professor of Heat Power Engineering here at Cornell.

Prof. Mackey prepared in Ithaca High School and entered Cornell University in 1921. The offer to teach at the end of his junior year forced him to spread his senior courses over two years, which put off graduation from Sibley College until 1926. Continuing to teach at Cornell, he was transferred to the Heat Power Department to fill a vacancy left by a resignation. He advanced rapidly in this department, being made Assistant Professor in 1929 and full Professor in 1936. He has tutored frequently in Mechanics, Heat Power, and Experimental Engineering. He enjoys this as much as regular teaching.

Believing that a professor should have close contact with his chosen field, Prof. Mackey has done consulting work in air-conditioning and refrigeration. He believes that the application of air conditioning to the control of the properties of materials during manufacture will open a new industrial field.

If summer work has anything to do with choosing a vocation, Prof. Mackey should have entered hotel management, for he worked as a bell hop for a hotel in the Adirondacks for three summers while a college student. He did devote some of his summers to engineering—in the Engineering Department of the Detroit Edison Company during one of his vacations while still in college. After graduatin, he worked for the Eastman Kodak Company and the Carrier Corporation. While working for the Carrier Corporation he picked up most of the material which he now teaches to seniors in the option on Fluid Flow, Heat Transfer, and Air Conditioning. Most of his summers now are devoted to the writing of books, papers, and technical articles. He is the author of "Graphical Computations" and "Air Conditioning Principles". At present he is working with Director Barnard and Professor Ellenwood on the revision of the text used in 3P33.

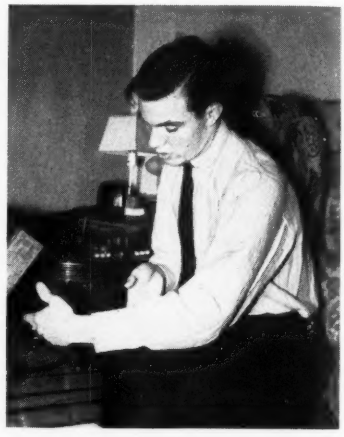
On the side, fishing seems to be his favorite hobby and he spends a great deal of his time fishing for salmon in Nova Scotia. Unfortunately, the fish aren't always biting, and he has to resort to the usual subterfuge—buying some fish and having a photograph taken for the benefit of his friends. Tennis, golf, and squash are his favorite sports, but he spends a great deal of his time devising graphical solutions or slide rules for the solution of problems in engineering.

"Teaching," he says, "is most unsatisfactory in that you cannot see the results of your labor." This may be true, but the influence of such outstanding men on the faculty as Prof. Mackey makes an indelible impression on many Cornell students.

Bob Meachem

Bob Meacham's career at Cornell is synonymous with the career of the Cornell Radio Guild. His interest in radio was planted in his high school days, grew during a year of work as a guide trainer at Radio City, and finally blossomed during the last few months, when he was the moving spirit in establishing Cornell's new radio station, CRG. The course of study that this radio-man follows is obvious—electrical engineering.

Bob entered Cornell in September of 1936 and wasted little time in showing that he was destined to become the leader of radio at Cornell. Following a short period of apprenticeship in the Cornell Radio Guild, he was promoted to the post of technical director.



CRG Meachem

Paralleling his freshman radio activities were his scholastic and athletic achievements—he made the Dean's List and the frosh tennis squad.

The sophomore year of Cornell's radio man was spent in maintaining a good scholastic average and taking care of as much of WESG (Cornell's commercial broadcasting station) as he could. Bob's contributions to campus life were rewarded by appointment to the Sophomore Cotillion Committee, a committee which was revived for the first time in several years.

A desire to see more of the country and to throw a little bit more practicality into his education caused Bob to go to the West Coast. He stayed there for several months familiarizing himself with business conditions.

It was February, 1939, when Bob again returned to Cornell to begin his third year of electrical engineering. His reception was marked by election to Eta Kappa Nu and to the presidency of the

(*Continued on page* 24)

Cornell's Engineers

"Lanse" Lansing

Because of his father's profession as a tunnel engineer his home in Cranford, New Jersey serves only as a temporary residence. No doubt, some of his enthusiasm for his chosen vocation of Civil Engineering is due to the fact that his father has been prominently connected with this field of endeavor for a number of years.

"Lanse" as he is known to his friends, entered Cornell via Cranford High School, from which he was awarded a McMullen Scholarship on the basis of his scholastic record. He successfully began his college career by being placed on the Dean's Honor List; an honor which he has repeatedly achieved.

Among his extra-curricular activities, he has served his class in Civil Engineering in the capacity of president, and also as secretary. In addition to the other honors bestowed upon him, he was elected in his Junior year to Tau Beta Pi,

Construction Engineer

Chi Epsilon, and Pyramid. These rewards serve to display his versatility and the outstanding merit he has shown throughout his undergraduate career. He was a prominent member of the executive committee in charge of Cornell Day and also a member of the Freshman Advisory Committee.

His fraternity, Delta Tau Delta, honored him by electing him president of the house. At one time in his undergraduate career he was a track compet, although he ruefully admits he was not too successful. In spite of the fact, however, that he did not win a berth on the team, the work was worth the fun that he derived from it.

He has spent his last two summers working as an assistant engineer. Tunnel construction is a phase of civil engineering in which he is greatly interested. His position as an assistant for the Walsh Construction Company on the new Delaware Aqueduct gave him a wealth of practical training and knowledge which will no doubt prove invaluable to him after graduation.

When requested to outline his plans for the future, he revealed that naturally enough he wished to enter some branch of construction engineering. Although he did not definitely state that he will go into tunnel construction, the prospects seem likely. If his scholastic record is a criterion, a prosperous future is assured him in the field of engineering.

The Hillsleys

Pictured here are Fred and Jack Hillsley, two outstanding A.E. seniors and the only twins on the engineering campus. People have often remarked that they have difficulty in telling the boys apart and from the looks of their picture we would say that there is some point to the statements.

Perhaps the most interesting part of Fred's and Jack's lives has come during the summer months between school years, although if their records are any indication, the months devoted to school work have not been without incident. Fred and Jack are identical twins but so similar are their records that they read almost like the record of one person.

Both are members of Tau Beta Pi, the Freshman Advisory Committee, and the A.S.M.E. Both have also participated in varsity swimming since their sophomore year. Their decision to go out for varsity swimming was not a sudden inspiration for both have been interested in swimming as long as they can remember. Their first real swim goes back to the time when their mother took them down to Asbury Park to the beach. Their mother evidently is one who believes that practice makes perfect; consequently, in spite of considerable argument in the way of screaming and yelling, the boys soon found themselves in the water off the end of a pier with the choice of sinking or swimming. Needless to say they chose the former and have been at it ever since. They both went out for crew in the fall of their freshman year and when winter came, practice shifted to the Old Armory. It was while working out up there that both decided that they would rather be in the water than on top of it, and their efforts have been in this direction ever since. Fred is president of Kappa Tau Chi, and is rushing chairman of his fraternity, Sigma Phi Epsilon while Jack is the House President.

When both leave Cornell next June to work for some company it will be no new experience for either of them. Both started to work during the summer between their junior and senior years at Newtown High School in Elmhurst, N. Y. Fred worked as a mail clerk in a paper box company that summer, and Jack was a runner for a textile company. The following summer saw Fred back at the same job while Jack had changed his field of operations to a printing company where he was a "printer's devil."

Both Fred and Jack are in the Ordnance division of the R.O.T.C.

(*Continued on page* 24)

Fred and Jack—or is it Jack and Fred?

News of the Engineering College

Journalism

A course in Engineering Journalism will be added to those offered by the College of Engineering, beginning with the second term, Dean Hollister has announced. This innovation is designed to give technical instruction both in editorial procedures and in business methods to members of the staff of the Cornell Engineer.

Staff members may take the course for two years and secure a total of four hours credit. Writing of technical articles, copy reading, proof reading, makeup, and other editorial procedures, as well as accounting, advertising, the handling of circulation problems, and other phases of business management will be covered. The work will be given in two separate sections, one for editors and the other for members of the business staff.

Assistant Professor R. Y. Thatcher of the School of Civil Engineering will be in charge of the business management section. To teach the editorial section, Dean Hollister has appointed Raymond F. Howes instructor in engineering journalism. A graduate of Cornell in 1924, Mr. Howes holds A. B. and M. A. degrees. Before returning to the university in 1936, he was assistant professor of English in Washington University, St. Louis, where he directed the four-year course for the B. S. in Journalism and was chairman of the faculty committee on student publications. He has also had journalistic experience as a reporter and editor on the Elmira Advertiser and a free-lance writer for The Outlook, The American Mercury, and other magazines. Since 1937 he has been assistant to the dean of the College of Engineering.

The Dean and Defense

Dean Hollister has been appointed regional adviser for that part of the State of New York outside New York City, in a new national program for Engineering Defense Training. Congress recently appropriated $9,000,000 for special engineering courses to be given on a college level at the government's expense. The purpose of this drive is to train 30,000 students with technical backgrounds to meet future needs of both industry and government in carrying out the defense program.

Dean Hollister will serve as liaison officer maintaining continual contact with defense industries, Army and Navy district offices, employment services, and the other sources of information on personnel needs, as well as with local engineering schools equipped to meet demands for training courses as they arise. He will keep the Washington headquarters continually informed so that deficiencies in any one region may be remedied, if necessary, by training students in other places where facilities are available.

Honoraries

Eta Kappa Nu

Director W. A. Lewis of the School of Electrical Engineering was the main speaker at the Eta Kappa Nu initiation banquet held in the Dutch Kitchen on Tuesday night, December 17th.

New men initiated were:

Class of '41

William Charles Don
Charles Joseph Juhnke

Class of '42

John Gray Aldworth
Albert Brodzinsky
Francis Brendan Burke
George Franklin Critchlow
Harry Jeannot Lipkin
Joseph Cook Middleton
Leonard Schley
William Jordan Sloughter

Atmos

Atmos, honorary mechanical engineering society, held its initiation banquet at Willard Straight Hall on December 12th. The principal speakers were Professor John R. Moynihan and Dean Emeritus Dexter S. Kimball.

Tau Beta Pi

Tau Beta Pi, national honorary engineering society, held its initiation banquet at the Dutch Kitchen on Tuesday night, December 3rd. Director F. H. Rhodes of the School of Chemical Engineering was the principal speaker and Noland Blass '41 Arch acted as toastmaster. Kirk M. Reid '20 EE, highway lighting engineer at the General Electric Company's Nela Park station near Cleveland, was also initiated. Mr. Reid gave a short talk.

Director Rhodes expressed a belief that regardless of the outcome of the present European conflict, engineering will continue to be a very important profession.

Kappa Tau Chi

At the Alpha Delt house on the evening of December 6th, Kappa Tau Chi, honorary administrative engineering society, held its annual smoker for administrative engineers in the classes of '43 and '44. Dean Emeritus Dexter S. Kimball was the principal speaker; Prof. F. Alexander Magoun of M.I.T. also spoke to the group.

Chi Epsilon

Chi Epsilon and Gargoyle, honorary civil engineering and architecture societies respectively, jointly held an initiation banquet on December 16th. Prof. G. H. Robinson of the Law School was principal speaker.

Secretary-Treasurer Bob Clark '41 CE represented the Cornell chapter at the Biennial Chi Epsilon Conclave held on December 7th at Iowa City, Iowa.

Societies

ASCE

Major J. C. Marshall, district officer of the U. S. Engineers office in Binghamton, spoke at a joint meeting of the Ithaca section and student chapter of the ASCE on Thursday, November 28th, concerning "The New Corps of Engineers".

He pointed out that there is an essential difference between the U. S. Engineering Department and the Engineering Corps. The Engi-

neering Department is composed of civilian engineers, headed by a few selected War Department engineers, who engage in civilian work such as dredging of harbors and flood control. The Engineering Corps, however, is entirely military; its function is to aid the advance of infantry or artillery by building bridges, making rafts, and assembling assault boats to ferry troops across streams. Major Marshall's talk was illustrated with movies showing how pontoon bridges are built in sections; also how they are assembled and held together by means of an automatic lock. Another movie showed the new ply-wood assault boats and how they are made and transported.

ASME

A sound movie, "The Magic of Modern Plastics", was shown in full colors at the regular meeting of the ASME on Tuesday evening, December 10th. The film pertained to the development of plastics and their modern applications in the manufacture of distinctive articles of merchandise.

Chairman Bob Ross '41 AE, attended the annual ASME convention at the Hotel Astor in New York as the representative of the Cornell student branch.

The election of officers is to take place at the regular meeting on January 9th, which will be followed by the initiation banquet and installation of newly elected officers to be held on January 17th at the Dutch Kitchen. Tell Berna '12 ME, nationally prominent General Manager of the National Machine Tool Builders' Association, will be the guest speaker.

AIEE

At the regular meeting of the AIEE on Monday, December 9th, Mr. Kunz, company engineer of the Weston Instrument Corporation described the six different types of mechanical movements used in electrical indicating instruments.

AIChemE

Illustrating his talk with motion pictures, Dr. Wynd of the Eastman Kodak Company spoke on "Safety Factors in Industry" at the regular meeting of the AI ChemE on December 5th.

Competition

Sophomores and Freshmen

Here's your chance! On Thursday, February 13th, our spring competitions are being opened to freshmen and sophomores eager for positions on the editorial staff and to sophomores anxious to make the business staff. These will be short competitions, lasting until April 1st.

To You Freshmen: By now you have become acclimated to the collegiate way of doing things; you have learned how to budget your time in such a way that you don't have to burn the midnight oil too often in pursuit of knowledge, nor do you have to go to class with only half your lessons prepared—in short, you have learned how to study, how to concentrate. Your studies are important; they are your principal reason for being here. But they no longer require so much time and you should therefore look ahead—look for some activity in which you will gain valuable knowledge, make contacts with the professors and eminent students in the engineering school, and make new friends. Such an activity is The Cornell Engineer.

The new program inaugurated by the engineering college, in which staff and board members of The Cornell Eng'neer will receive university credit and also the benefit of competent instruction in journalism and business methods, should in themselves urge you to come out for this competition. Add to them the prestige and contacts which this activity will give you, and you will realize the value of this competition and the position on the staff to which it leads.

To You Sophomores: Cornell is no longer strange to you—you are fully aware that this is the last year in which you can get into an activity, make a name for yourself and perhaps make yourself eligible for honorary societies. It is still not too late to take advantage of this excellent opportunity.

REMEMBER the 13th of FEBRUARY!

Engineering College Council

The Engineering College Council, a group composed of several officers and prominent alumni of the University, met here on Monday, December 9th, to consider important matters concerning the welfare of the college. Those present, besides President Edmund E. Day and Dean S. C. Hollister, were Walter L. Cisler, assistant chief engineer in the electrical engineering division of the Public Service Electric and Gas Company; Alexander W. Dann, executive vice-president of the Dravo Construction Company; Dr. Harold W. Elley, assistant director of the duPont Research Laboratory; James W. Parker, vice-president of the Detroit Edison Company; Col. F. W. Scheidenhelm, consulting engineer; and John C. Wilson, vice-president of the Cutler-Hammer Company.

Student Engineering Council

"Men at Work!" Yes, the Student Engineering Council, swinging into action during a recent meeting, is now working hard on the theme and arrangements for the annual Engineers' Ball and the Cornell Day Engineering Show. Although the theme and the date have not yet been selected, Chairman Travers Nelson '41 ME says the annual social affair will be held some time between February 21st and March 14th. If it's as good as the elite Blue Moon Cabaret which, you remember, was last year's theme, you engineers had better do your mech labs some other night and "come to the party".

The Cornell Day show is to be held on May 2nd. This year's faculty advisers to the Council are:

Mr. Raymond F. Howes, Dean's Office; Prof. J. R. Moynihan, ME; Prof. R. F. Chamberlain, EE; Prof. H. T. Jenkins, CE; Prof. O. J. Swenson, ChemE.

Soph: "What is your greatest ambition?"

Frosh: "To die a year sooner than you do, so I'll be a sophomore in hell when you get there."

Employment

(*Continued from page 6*)

interested. Do not overlook this group of possible jobs.

The Personnel Office of the Engineering College is a part of the University's placement service to its students and graduates. The University Placement Bureau coordinates the senior placement work of the various colleges and handles most of the alumni placement work. Its quarters are in Willard Straight Hall. The Bureau's objective in connection with the placement of engineering seniors is to make available to those seniors through the Personnel Office in the Engineering College or through its own offices, as great a number of employment opportunities as possible. It is attempting to "market" the product of the engineering college through advertising, correspondence with employers, field visits, etc. Employers are urged to turn to the University when in need of new men and every effort is made to serve them well.

Jobs do not often last forever and even the best of men and companies must sometimes part. Every senior should know of the continued interest of the University in his welfare, and of the placement service for alumni which is tangible evidence of that interest. This alumni placement work is a function of the University Placement Bureau and its associated office in New York, the Employment Service at the Cornell Club, managed by Mr. Paul O. Reyneau '13. The Bureau has a field organization of placement secretaries, each appointed by his local Alumni Club to cooperate with the Ithaca office on placement problems in his territory. It keeps an active file of alumni who have indicated their interest in new jobs, assembling their experience records and references so they will be available to employers. A "Job Bulletin" listing current openings is published every two or three weeks and mailed to those registered. Seniors are invited to use this service during their future careers whenever they wish such assistance.

Housing

(*Continued from page 14*)

system is to get 115 volts at all the lighting outlets. Toward this end, taps are put on transformers to raise the voltage slightly, so that it will be just right at the point of use.

At the buildings, main panels with provision for metering to each tenant are usually located in a closet at the center on the outside wall. Each panel has a main switch which controls all the lights in the building. Fuses for each dwelling unit are located in the panel, and must be replaced by the management if they are blown. The management may then investigate to make sure no faulty equipment is being plugged in on the circuit. Each tenant is allowed so many kilowatt-hours per month included in his rent. All units are not metered continuously, but if the manager discovers that a tenant is using too much current, he check-meters him without disrupting the tenant's service.

Dwelling units are wired on either two or three circuits. All rooms have base receptacles at least every twenty feet. The first low-cost housings were provided with a wall switch at each entrance to control a base receptacle near the door. It was found, however, that few of the tenants had table lamps or floor lamps to plug into the base receptacle; so a ceiling fixture with shadeholder groove, controlled by a wall switch, was installed. The kitchen, which in some types of units also serves as the dining room, is wired in the same manner as the living room, with extra provision for a refrigerator.

Bathrooms used to be provided with a ceiling outlet and combination switch and receptacle for shaving. Electrical shaving being considered an unnecessary luxury, bathrooms now have only a pull-chain ceiling outlet above the wash stand. Stairwell lights of two-story units are controlled with a pair of three-way switches. Each bedroom is furnished with a wall bracket near the door, containing a switch and receptacle. In general, the wiring is simple, but adequate for the needs of the tenants. In order to improve lighting conditions in housing projects, the American Lighting Equipment Association is carrying on lighting research with the help of U. S. H. A. engineers. Their object is to develop an inexpensive. sturdy lighting fixture which will give maximum lighting efficiency in the more or less standard-sized rooms of low-rent housing projects.

When asked about the comparative costs of government housing and private buildings, one engineer replied that housing was more expensive; but (and this is important) the cost was rock bottom considering the life expectancy of a housing project. Since the engineer must stay with a housing job and maintain it, he puts in the type of construction which is the most permanent. In order to insure that the contractors put in the materials specified and not some substitute that they can buy cheaper, the Government insists on thorough inspection, which also runs up the cost.

Contractors are able to reduce their expenses by using a sort of production-line program in construction of the buildings. This is possible because the buildings are usually very much alike. One crew does the excavating for the first building and moves on to the next. Bricklayers and carpenters follow them around. Other trades follow in order, starting with the same building. Soon there will be buildings in all stages of construction. By this method, the first few buildings are finished first and can be occupied before the others are completed. This extra rent means that the project will pay for itself sooner.

At present, industrial housing projects are being built at unbelievable speed to house workers for our rapidly expanding defense industries. By increasing the shifts of workmen, some defense projects will be built in 120 days, including time for planning and bids to be received. Housing is an ever-present challenge to engineers to direct their intelligence toward that important necessity of life—shelter.

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The Hillsleys

(*Continued from page* 19)

and six weeks of last summer were spent at the Aberdeen Proving Grounds as part of their advanced training. Following this they decided that a good rest was in order; so they headed for the west with a friend from M.I.T. and his brother, now a freshman at Cornell. The four of them travelled over 13,000 miles during the seven weeks they were gone, and we doubt if there is a National Park in the west that was not thoroughly covered. Notable incidents on the trip included their unguided climbing of 10,000 foot Mount Rising Wolf in the Rocky Mountains, and the driving of their car over a washout one night in Mexico until it teetered over a six foot drop.

The future plans of both Fred and Jack are a bit difficult to explain, although both know definitely what they want to do. Originally their primary interest centered around sales engineering. This interest was one of their chief reasons for coming to Cornell. Since entering, however, a secondary interest has become more and more prominent. This new interest is concerned with work in the field of Industrial Engineering. Regardless of future plans the Hillsleys can leave here with the knowledge that their four years have been well spent.

Meachem

(*Continued from page* 18)

Cornell Radio Guild. The Guild's activities were greatly expanded during the year due to the new president's capacity for organization and his knowledge of radio. Outstanding among his projects were the student programs put on over WGR (Buffalo) and WGY (Schenectady) and the increased student work performed by WESG (now WHCU). The Robert Henry Thurston Centennial program over WESG was another highlight. This program was later rebroadcast over many other stations. For his efforts, the Cornell Radio Guild gave him the best that they could, reelection to the office of president. Other honors included election to Tau Beta Pi and Quill and Dagger.

Upon coming back to school this fall, one noticed the absence of the "Mark Twain Hotel Station", WESG. Things in Cornell's radio organization had been changed during the summer—WESG had given way to WHCU, a transmitting station completely owned and controlled by Cornell University, and CRG, a station whose range was to be limited to the campus, was installed. CRG is Bob Meachem's crowning achievement. It represents hours of design work and many more hours of installation effort. CRG is now a member of the Intercollegiate Broadcasting System and it will broadcast regular programs on 640 kc in campus dormitories and buildings equipped with special oscillators.

Highways

(*Continued from page* 10)

with the high traffic over the bridge (1,424,800 vehicles during October, 1940) makes this low-toll rate possible. This bridge is about seven miles long, probably the largest in the world, and has several important features which were innovations in design and construction methods. C. H. Purcell, state highway engineer, acted as chief engineer of the bridge, being assisted by a board of consulting engineers, which included famous Eastern authorities. Glenn B. Woodruff, Cornell C. E. '10, acted as chief designing engineer, and the present operating and maintenance engineer in charge of the bridge is Ralph Tudor, a West Point graduate, who took a special course at Cornell in Civil Engineering.

Alumni News

(*Continued from page* 15)

in the Engineers Department, U. S. Army, he served overseas on the problem of supplying water to the front lines, for which he received a citation and the decoration of the Purple Heart. In 1930, he visited the hydraulic laboratories of Europe and, as a result of his observations, designed and built a hydraulic laboratory for Tulane University. He has been very active in the ASME since 1895 and has been a frequent contributor of technical papers to this and other societies.

Stress and Strain

UNSHUCKED!

Baby ear of corn: "Where did I come from, mama?"

Mama: "Hush, darling, the stalk brought you."

The buxom woman was standing in the street car, holding to a strap. The cantankerous looking old man was seated reading. The car swung and she stepped on his foot.

"Madam," he barked, "will you please get off my foot?"

"Put your foot where it belongs," she replied sharply.

"Don't tempt me, madam, don't tempt me," he countered.

—and then there's the one about the old Scotsman, who was smoking in the railway station.

A porter said to him, "don't you see that sign on the wall, 'NO SMOKING ALLOWED'?"

"Yes, I do," rejoined the Scot, "but how can I keep all of your rules? here is another sign on the wall, 'WEAR SPIRELLA CORSETS'."

Bits of wisdom from an E.E.'s pen—

If your sweetheart is a blonde and you love a brunette, transformer.
If she gets grouchy, tickler.
If she wants to meet you for lunch, meter.
If she wants a fur coat, resistor.
If she continues to insist, eliminator.

BACHELOR'S THEME

He married Helen,
Hell ensued,
He left Helen,
Helen sued.

REMINDING US OF—?

At a meeting of the Building Committee, the following three resolutions were passed:

"Resolved: (1) To build a new Engineering Building,

(2) To build the new building out of the materials from the old buildings,

(3) To use the old buildings until the new building is completed.

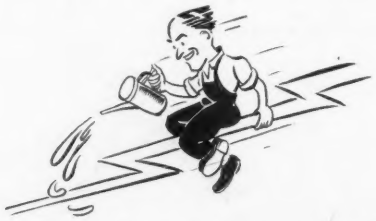
—Nebraska Blueprint.

G-E Campus News

STOP THIEF!

BURGLARS and other criminals can no longer hope that bad radio weather will increase their chances of a getaway by gumming up police radio. Atmospheric disturbances, ignition noises, street car interference—in fact all the reception devils that plague the life of radio police practically disappear with the introduction of frequency modulation, the new method of broadcasting developed by Major E. H. Armstrong. Several two-way FM installations have already been made. One of the first was in Douglas County, Nebraska, which recently installed a number of G-E transmitters and receivers.

Among those responsible for many of the G-E developments which have made two-way FM possible are I. R. Weir (Rose Poly, '21) and H. P. Thomas (Harvard, '25)—transmitter engineers; and W. C. White (Columbia, '12) and K. C. DeWalt (Iowa, '27)—vacuum tube engineers.

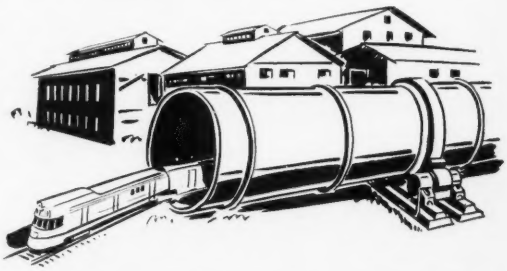


GREASED LIGHTNING

THIRTY-ONE hundred revolutions a minute is lightning fast all right. But when a bearing revolving at that speed makes more noise than a boiler factory and coasts to a stop in 12 seconds, then it's time to look for a good lubricant. There's a catch though; the bearing is a part of an x-ray tube and operates in a high vacuum. The tendency of oil and grease to vaporize under these conditions makes it impossible to use ordinary lubricants.

So G. E. X-Ray Corporation engineers Atlee (Oregon State, '29), Filmer (Armour Tech, '31), and Wilson (College of Emporia, '31) set to work and developed a new lubricant—barium. When a thin film of this metal was applied to the bearing, its speed rose to over 3500 rpm, the noise of operation was materially reduced, and the coasting time was increased to eight minutes.

The benefit of these young men's research is not limited to the x-ray field alone, for their findings will apply equally well in all cases where rotating devices operate in a vacuum.



GARGANTUAN GARAGE

IF Burlington Railroad officials would give their permission, you could drive their Twin Zephyrs into the newest kiln of the Permanente cement mill in California and still have enough room left over for a large freight car.

This cement kiln, one of the largest pieces of rotating machinery in industry, measures 450 by 14 feet. It will be used in furnishing 6,000,000 barrels of cement for the construction of Shasta Dam.

The kiln will be driven by a 200-hp G-E motor—the largest ever built for this purpose and representing an innovation in design as well as size.

The big motor was tested by young engineering college graduates taking the General Electric Test Course at Schenectady.

GENERAL ELECTRIC

953-11